

CLINICAL OUTCOME METRICS FOR OPTIMIZATION OF ROBUST TRAINING

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INTRODUCTION

The emphasis of this research is on the Human Research Program (HRP) Exploration Medical Capability's (ExMC) "Risk of Unacceptable Health and Mission Outcomes Due to Limitations of In-flight Medical Capabilities". Specifically, this project aims to contribute to the closure of gap *ExMC 2.02: We do not know how the inclusion of a physician crew medical officer quantitatively impacts clinical outcomes during exploration missions*. The experiments are specifically designed to address clinical outcome differences between physician and nonphysician cohorts in both near-term and longer-term (mission impacting) outcomes.

METHODS

Medical simulations will systematically compare success of individual diagnostic and therapeutic procedure simulations performed by physician and nonphysician crew medical officer (CMO) analogs using clearly defined short-term (individual procedure) outcome metrics. In the subsequent step of the project, the procedure simulation outcomes will be used as input to a modified version of the NASA Integrated Medical Model (IMM) to analyze the effect of the outcome (degree of success) of individual procedures (including successful, imperfectly performed, and failed procedures) on overall long-term clinical outcomes and the consequent mission impacts. The procedures to be simulated are endotracheal intubation, fundoscopic examination, kidney/urinary ultrasound, ultrasound-guided intravenous catheter insertion, and a differential diagnosis exercise. Multiple assessment techniques will be used, centered on medical procedure simulation studies occurring at 3, 6, and 12 months after initial training (as depicted in the following flow diagram of the experiment design).

DISCUSSION

Analysis of procedure outcomes in the physician and nonphysician groups and their subsets (tested at different elapsed times post training) will allow the team to

- 1) define differences between physician and nonphysician CMOs in terms of both procedure performance (pre-IMM analysis) and overall mitigation of the mission medical impact (IMM analysis);
- 2) refine the procedure outcome and clinical outcome metrics themselves;
- 3) refine or develop innovative medical training products and solutions to maximize CMO performance; and
- 4) validate the methods and products of this experiment for operational use in the planning, execution, and quality assurance of the CMO training process

The team has finalized training protocols and developed a software training/testing tool in collaboration with Butler Graphics (Detroit, MI). In addition to the "hands on" medical procedure modules, the software includes a differential diagnosis exercise (limited clinical decision support tool) to evaluate the diagnostic skills of participants. Human subject testing will occur over the next year.

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